The Lancet: More than 39 million deaths from antibiotic-resistant infections estimated between now and 2050, suggests first global analysis

Published September 16, 2024

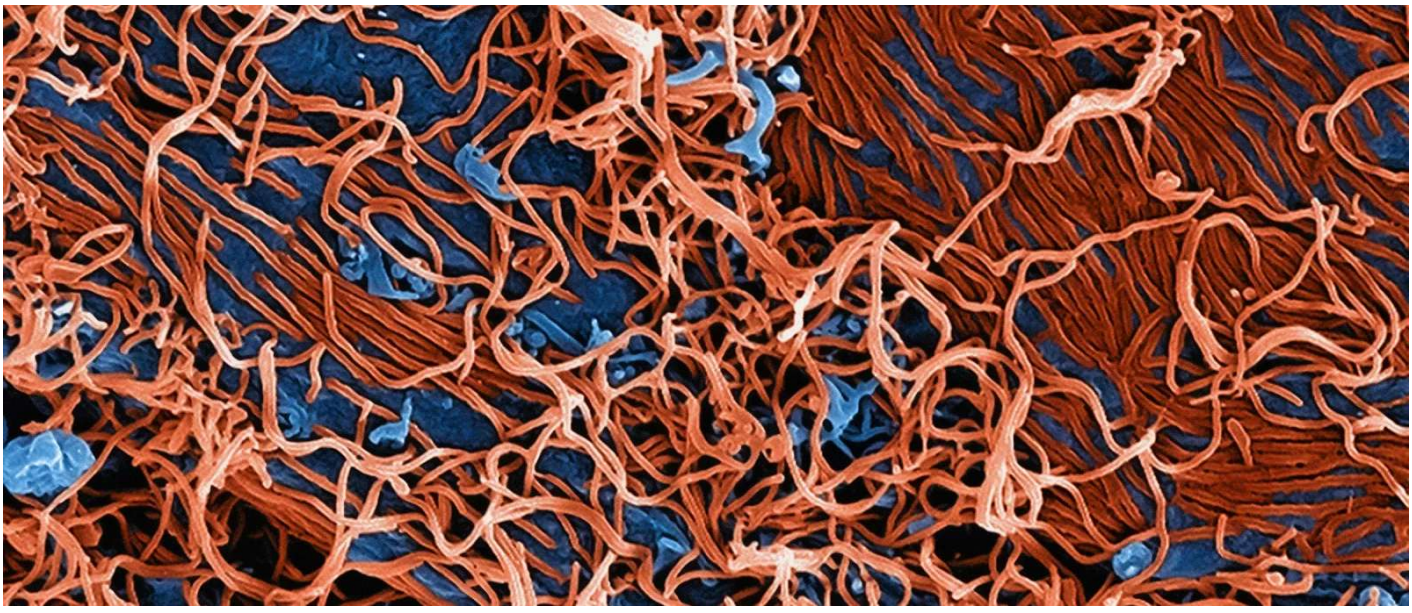

Photo by National Institute of Allergy and Infectious Diseases, Unsplash.

Key takeaways:

- **First in-depth analysis of global health impacts of antimicrobial resistance (AMR)** over time reveals trends from 1990 to 2021 and estimates potential impacts to 2050 for 204

countries and territories.

- **More than one million people died from AMR globally each year** between 1990 and 2021. Over the period, AMR deaths among children aged under five declined by 50% while those among people aged 70 and older increased by more than 80%.
- **Future forecasts indicate AMR deaths will rise steadily** in the coming decades, increasing by almost 70% by 2050 compared to 2022, continuing to more greatly impact older people.
- Estimates suggest improved access to health care and antibiotics could **save a total of 92 million lives between 2025 and 2050.**
- **The findings highlight the need for decisive actions** – including improved healthcare, expanded prevention and control measures, and new antibiotics – to protect people from the threat of AMR.

Topics

ANTIMICROBIAL RESISTAN... | FORECASTING (/SEARCH?F...

HIGHLIGHT

By 2050, antibiotic resistant infections could be involved in some 8 million deaths each year, e
the direct cause of death or as a contributing factor.

SHARE

Originally posted by The Lancet

More than 39 million people around the world could die from antibiotic-resistant infections over th
years, according to a study published in *The Lancet* (https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(24)01867-1/fulltext).

The new study by the Global Research on Antimicrobial Resistance (GRAM) Project is the first gl
of antimicrobial resistance (AMR) trends over time.

It reveals that more than one million people died each year as a result of AMR between 1990 and 2 study also estimates 1.91 million people could potentially die as a direct result of AMR in 2050, an almost 70% per year compared to 2022. Over the same period, the number of deaths in which AM play a role will increase by almost 75% from 4.71 million to 8.22 million per year.

Between 1990 and 2021, AMR deaths among children under five years old declined by 50%, while people aged 70 years and older increased by more than 80%. These trends are predicted to conti coming decades, with AMR deaths among children under five projected to halve by 2050 globally, among people 70 years and older more than double.

> "Antimicrobial medicines are one of the cornerstones of modern healthcare, and increasing resistance to them is major cause for concern."

The findings highlight a vital need for interventions that incorporate infection prevention, vaccinat minimising inappropriate antibiotic use, and research into new antibiotics to mitigate the number that are forecasted for 2050.

“Antimicrobial medicines are one of the cornerstones of modern healthcare, and increasing resist is a major cause for concern. These findings highlight that AMR has been a significant global heal decades and that this threat is growing. Understanding how trends in AMR deaths have changed how they are likely to shift in future, is vital to make informed decisions to help save lives,” said stu Mohsen Naghavi, Team Leader of the AMR Research Team at the Institute of Health Metrics (IHM of Washington, USA.

Already widely recognised as a major global health challenge, AMR – which occurs when bacteria pathogens change in ways that make them evolve to no longer respond to antimicrobials – is antic worsen in the coming decades. However, until now, no studies have assessed historical trends of provided in-depth forecasts of future global impacts.

The first GRAM study, published in 2022, revealed the true scale of AMR for the first time. It found AMR-related deaths in 2019 were higher than those from HIV/AIDS or malaria, leading directly to deaths and playing a role in a further 4.95 million deaths. [1]

Estimates for the new GRAM study were produced for 22 pathogens, 84 pathogen-drug combinat infectious syndromes (including meningitis, bloodstream infections, and other infections) among ages in 204 countries and territories. The estimates were based on 520 million individual records range of sources, including hospital data, death records, and antibiotic use data.

Statistical modelling was used to produce estimates of deaths directly from AMR and those in whi played a role. Based on the historical trends calculated, the authors estimate the most likely globa health impacts of AMR from 2022 until 2050. Estimates were also produced for scenarios in which quality and access to antibiotics improve in the future and drug development targets Gram-negati

Shifting global trends

Their findings reveal that more than one million lives were lost each year from 1990 to 2021 as a d AMR. In 1990, there were 1.06 million deaths directly due to AMR of a broader 4.78 million associa 2021, AMR led directly to 1.14 million deaths and was associated of a broader 4.71 million deaths in 2021 were lower than in 2019 (1.27 million direct AMR deaths; 4.95 million associated deaths) d reductions in the burden of non-COVID lower respiratory infections, likely caused by social distan disease control measures in place during the COVID-19 pandemic. The team's analysis suggests AMR deaths was only temporary.

> "While infections have become less common in young children, they have become harder to treat when they oc

Over the three decades, trends in AMR deaths underwent a major age-related shift, with those am under five years old decreasing by more than 50% (59.8% reduction in direct AMR deaths, 488,0(deaths; 62.9% reduction in deaths linked to AMR, 2.29 million to 840,00 deaths). This decline coi major improvements in the delivery of infection prevention and control measures – such as vaccir programmes – among infants and young children. However, the proportion of infectious deaths ca by AMR increased by a relative 13.6% – to a total of 7.2% in 2021 – among children under five yea 1990 and 2021.

Over the same period, AMR deaths among adults 70 years or older increased by more than 80% (increase in direct AMR deaths, 519,000 in 2021; 81.4% increase in deaths linked to AMR, 2.16 mi due to rapidly ageing populations and older people's greater vulnerability to infection.

Deaths directly from AMR increased most in five global regions, where annual deaths rose by mo between 1990 and 2021: western sub-Saharan Africa, Tropical Latin America, high-income North Southeast Asia, and South Asia.

"The fall in deaths from sepsis and AMR among young children over the past three decades is an achievement. However, these findings show that while infections have become less common in y they have become harder to treat when they occur. Further, the threat to older people from AMR w increase as populations age. Now is the time to act to protect people around the world from the th

AMR," said study author Dr Kevin Ikuta of the University of California Los Angeles (UCLA) and affi professor at IHME.

Different pathogens

The findings reveal increasing resistance to critically important antimicrobials, with all but one of s pathogens rated by the WHO as the most difficult to treat leading to more deaths in 2022 compare

Deaths due to methicillin-resistant S. aureus (MRSA) increased the most globally, leading directly deaths in 2021 – more than doubling from 57,200 in 1990. Among Gram-negative bacteria –some resistant to antimicrobial drugs – resistance to carbapenems increased more than any other type from 127,000 in 1990 to 216,000 in 2021.

Future projections – worst can be averted by action now

The authors estimate that AMR deaths will increase steadily in the coming decades based on curr with 1.91 million annual deaths directly due to AMR projected by 2050 – a 67.5% increase on the 1 deaths in 2021. By the middle of the century, AMR is also projected to play a role in a broader 8.22 deaths – an increase of 74.5% on the 4.71 million associated deaths in 2021.

In total, between 2025 and 2050 it is estimated AMR will lead directly to more than 39 million deatl associated with a broader 169 million deaths.

Deaths among children under five years old will continue to decline, halving in 2050 compared to decline, 204,000 to 103,000 deaths), but these will be outpaced by increases in other age groups, those aged 70 years and older (146% increase by 2050, from 512,353 to 1,259,409). There will be differences globally, with a 72% increase in deaths among people 70 years and older in high-incor compared to a 234% increase in North Africa and the Middle East.

> "There has been real progress in tackling AMR, particul among young children, but our findings indicate more m be done to protect people from this growing global healt threat."

Future deaths from AMR will be highest in South Asia – which includes countries such as India, Pa Bangladesh – where a total of 11.8 million deaths directly due to AMR are forecast between 2025 a

Deaths from AMR will also be high in other parts of southern and eastern Asia and sub-Saharan A depth figures for specific regions are available in Table S17 in Appendix 1).

The team's modelling of alternative future scenarios reveals improving overall infection care and a antibiotics could prevent 92 million deaths between 2025 and 2050 (see Appendix 1, pages 77 an The greatest benefits would be in South Asia, sub-Saharan Africa, and parts of Southeast Asia, E Oceania, with 31.7 million, 25.2 million, and 18.7 million deaths averted, respectively. Under the s which new antibiotics targeting Gram-negative bacteria were developed, estimates indicate 11.0 attributable deaths could be averted globally over the same period.

"There has been real progress in tackling AMR, particularly among young children, but our findin more must be done to protect people from this growing global health threat. By 2050, resistant inf be involved in some 8 million deaths each year, either as the direct cause of death or as a contribu prevent this from becoming a deadly reality, we urgently need new strategies to decrease the risk infections through vaccines, new drugs, improved healthcare, better access to existing antibiotic guidance on how to use them most effectively," said study author Dr Stein Emil Vollset of the Norv Institute of Public Health and affiliate professor at IHME.

The authors acknowledge some limitations to their study. A lack of data for some LMICs highlight improved data collection – which requires investment in infrastructure – to strengthen estimates f countries and improve the accuracy of future AMR forecasts. Some of the 520 million individual re produce the estimates may contain errors or biases. There was also limited reporting of AMR data which may affect the strength of historical estimates in the 1990s.

Writing in a linked Comment (https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(2 3/abstract), Professor Samuel Kariuki, of the Kenya Medical Research Institute, who was not invo study, said: "The model successfully evaluated the changing trends in AMR mortality across time that is necessary to understand how the burden of AMR is developing, and to provide evidence fo stakeholders to make informed decisions regarding interventions." Professor Kariuki concludes, "These data should drive investments and targeted action towards addressing the growing challe all regions."

For interviews with the Article authors, please contact the media team at IHME: E) ihmemedia@u (mailto:ihmemedia@uw.edu)

READ MORE ON WELLCOME (HTTPS://WELLCOME.ORG/NEWS/NEW-FORECASTS-RE

BACK TO TOP (#MAIN-CONTENT)

Datasets

All our datasets are housed in our data catalog, the Global Health Data Exchange (GHDx). Visit the GHDx to download data from this article.

(https://ghdx.healthdata.org/record/ihme-data/gbd-2021-bacterial-amr-estimates-forecasts-1990-2050)

GBD 2021 Bacterial Antimicrobial Resistance Burden Estimates 1990-2021 and Fore…

Related

SCIENTIFIC PUBLICATION

Global burden of bacterial antimicrobial resistance 1990–2021: a systematic analysis with forecasts to 2050 (/research-…

MOHSEN NAGHAVI, STEIN EMIL VOLLSET, KEVIN IKUTA, CHRISTOPHER J.L. MURRAY, BENN SARTORIUS, ANDY STERGACHIS,...

VIDEO

Q&A: Antimicrobial resistance is a growing health threat (/news-events/newsroom/videos/qa antimicrobial-resistance-…

LAST UPDATED

September 16, 2024

INTERACTIVE DATA VISUAL

MICROBE (/data-tools-practices/interactive-visuals/microbe)

LAST UPDATED
September 16, 2024

September 16, 2024

HEALTH TOPIC

Antimicrobial resistance (AMR) (/research-analysis/health-topics/antimicrobial-resistance-amr)

LAST UPDATED
November 13, 2025

Subscribe to our newsletter

Email Address

SUBSCRIBE

IHME

INSTITUTE FOR HEALTH METRICS
AND EVALUATION

Hans Rosling Center for Population Health
3980 15th Ave NE, Seattle WA 98195
UW Campus Box #351615
Phone: +1 (206) 897-2800
Fax: +1 (206) 897-2899

Most popular pages

Announcing launch of the GBD 2023

Global Burden of Disease (GBD)

GBD Data

Data sources

Financing Global Health 2025: Cuts in Aid and Future Outlook

Interactive data visuals

GBD Results

Country profiles

Global burden of vision impairment due to age-related macular degeneration, 1990–2021, with forecasts to 2050

Global Burden of Disease 2023: Findings from the GBD 2023 study

GBD Publications

GBD Compare

Data tools and practices

Global, regional, and national burden of Chagas disease, 1990–2023

GBD Collaborator Network

Research and analysis

Global, regional, and national prevalence of kidney failure with replacement therapy and associated aetiologies, 1990–2023

About us

Mission and vision

Diversity, Equity, and Inclusion

Our people

Careers

Awards

Our history

Contact us

Privacy policy

Terms and conditions